

Persistence of the yield advantage of perennial ryegrass cultivars: concept, evidence and implications

David F. CHAPMAN, Cameron I. LUDEMANN, Wendy M. GRIFFITHS, Laura ROSSI, Deanne WAUGH and Barbara KUHN-SHERLOCK

Additional File 1: Tables A1 – A5.

Table A1 Monthly rainfall (mm) for the Waikato site.

Month	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	30-yr mean
January		118	7	34	53	64	48	275	23	6	80
February		42	20	15	45	88	101	184	14	10	65
March	159	111	23	10	75	34	238	51	29	64	77
April	111	65	124	135	175	40	251	95	80	53	87
May	125	95	192	69	127	120	114	125	45	73	105
June	166	94	149	187	67	139	54	115	85	96	123
July	151	171	31	117	108	132	158	116	110		122
August	28	129	64	67	89	83	122	139	136		107
September	56	92	129	132	123	113	168	53	142		92
October	112	91	62	83	39	99	113	53	75		96
November	32	34	94	83	105	84	36	78	58		80
December	206	123	85	85	32	45	86	186	75		100
Year total		1165	980	1016	1037	1042	1489	1469	871		1134

Table A2 Monthly maximum and minimum temperatures (°C) for the Waikato site.

Month		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	30-yr mean
January	Max		21.3	26.2	24.9	26.9	25.1	22.7	26.8	26.1	24.9	24.2
	Min		11.6	11.7	9.9	13.4	14.5	12.4	15.9	14.2	12.1	12.9
February	Max		22.1	27.5	27.1	25.3	26.6	24.6	25.5	27.9	27.7	24.6
	Min		12.0	10.3	12.1	12.9	16.3	13.8	14.1	12.7	12.4	13.2
March	Max	23.3	20.3	27.1	24.5	24.6	24.1	23.3	25.1	25.3	24.6	23.0
	Min	11.6	9.9	11.1	10.3	13.0	13.7	13.9	13.0	13.0	10.2	11.2
April	Max	18.4	19.5	23.1	22.3	20.9	21.1	21.1	21.2	20.6	21.8	20.2
	Min	7.8	8.4	9.9	11.5	10.2	10.0	11.3	9.5	8.3	7.7	9.2
May	Max	16.9	15.0	19.1	17.7	17.3	19.2	16.9	18.8	18.2	18.7	17.1
	Min	7.5	4.3	6.3	6.3	7.1	9.8	6.7	7.2	7.8	6.1	6.9
June	Max	14.4	13.1	15.7	16.7	15.2	15.8	16.4	15.5	14.8	17.0	14.4
	Min	6.0	2.5	3.9	7.2	6.3	6.1	4.1	4.5	4.1	6.5	4.9
July	Max	12.7	12.4	15.8	14.5	14.1	14.5	14.2	15.3	15.2		13.9
	Min	3.8	2.8	3.2	4.0	4.0	4.8	3.3	3.4	5.4		4.1
August	Max	13.1	14.0	17.4	15.5	15.1	15.0	16.0	16.0	14.7		14.7
	Min	2.1	4.2	5.7	5.0	4.7	4.8	5.2	4.6	6.5		4.8
September	Max	14.4	14.7	18.2	17.3	16.2	16.8	16.9	18.0	16.5		16.4
	Min	3.9	5.8	6.9	7.8	7.1	9.0	7.1	6.3	7.4		6.6
October	Max	17.1	16.5	19.9	18.5	18.6	18.4	18.3	19.7	17.7		18.0
	Min	8.0	6.3	7.2	8.9	9.2	8.9	8.9	6.6	9.1		8.4
November	Max	18.6	19.0	23.5	19.1	20.5	19.7	21.7	21.5	22.4		19.8
	Min	8.9	7.1	9.6	9.3	9.7	10.6	10.5	9.6	10.2		9.7
December	Max	21.0	24.8	24.3	22.4	22.0	21.6	25.6	24.1	23.4		22.1
	Min	11.9	12.5	10.7	12.9	12.4	11.3	12.7	13.0	12.5		12.0
Year mean	Max		17.7	21.5	20.0	19.7	19.8	19.9	20.6	20.2		19.0
	Min		7.2	8.0	8.7	9.1	9.9	9.2	8.9	9.2		8.7

Table A3 Monthly rainfall (mm) and irrigation (Irrig; mm) for the Canterbury site. Annual totals are not presented for 2011 and 2020 because these were incomplete.

Month		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	30-yr mean
January	Rain		30	30	12	10	91	42	99	36	7	39
	Irrig		89	71	150	85	30	70	60	90	71	
February	Rain		41	21	39	19	24	3	123	29	18	40
	Irrig		40	46	90	65	140	100	89	125	72	
March	Rain	59	68	41	136	40	34	73	32	24	23	48
	Irrig	92		68		30	40	19	16	19	25	
April	Rain	73	24	39	161	78	10	111	91	66	21	50
	Irrig		18				10				15	
May	Rain	51	10	130	45	6	80	48	48	11	22	59
	Irrig											
June	Rain	42	75	209	45	76	50	34	59	59	77	61
	Irrig											
July	Rain	21	41	30	49	37	15	128	26	68		53
	Irrig											
August	Rain	66	110	41	15	31	38	54	16	50		62
	Irrig											
September	Rain	31	29	31	25	56	25	55	39	32		38
	Irrig											
October	Rain	105	70	70	18	9	55	28	56	54		50
	Irrig		13		30	70				1		
November	Rain	54	53	46	45	13	30	0	107	58		49
	Irrig	10	41	45	55	20	52	115	42	22		
December	Rain	58	32	64	26	57	49	33	57	38		50
	Irrig	75	48	90	55	120	104	137	105	52		
Year total	Rain		582	751	615	432	502	609	753	525		599
	Irrig		249	320	380	390	376	441	312	309		

Table A4 Monthly maximum and minimum temperatures (°C) for the Canterbury site.

Month		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	30-yr mean
January	Max		20.9	23.4	21.8	23.4	20.3	22.7	23.1	23.9	22.1	21.2
	Min		10.5	11.5	9.8	13.2	12.2	11.0	14.7	13.0	11.7	11.2
February	Max		19.7	21.9	21.7	22.4	24.6	23.6	23.4	24.5	23.2	21.0
	Min		11.9	10.6	12.2	11.2	13.3	11.5	12.4	12.1	12.0	11.4
March	Max	20.5	18.5	21.0	18.5	20.8	22.0	19.3	20.5	22.1	19.8	19.6
	Min	10.0	8.5	11.1	9.6	11.2	11.1	10.6	11.6	11.7	9.3	9.5
April	Max	15.8	18.0	17.8	16.4	18.2	19.3	16.8	18.1	16.7	18.3	16.8
	Min	6.7	6.6	7.7	9.7	9.4	7.3	8.5	6.7	8.0	7.8	7.1
May	Max	15.4	14.6	14.1	15.7	16.5	18.1	13.8	14.6	15.9	16.0	14.2
	Min	7.3	4.0	5.9	5.1	4.1	7.4	3.3	5.8	5.4	5.2	4.7
June	Max	12.2	10.9	11.4	12.9	12.7	13.9	11.6	10.3	11.9	12.4	11.6
	Min	4.0	0.6	2.9	3.3	1.6	3.8	2.9	4.1	1.8	4.0	2.2
July	Max	11.2	11.4	13.4	11.2	11.9	12.9	10.2	13.1	13.1		10.8
	Min	0.7	1.1	2.1	2.0	1.7	1.2	2.7	2.0	4.3		1.6
August	Max	12.1	12.4	13.7	12.9	12.2	11.3	13.2	12.8	13.0		12.3
	Min	0.9	5.5	5.6	2.8	2.3	1.8	3.4	3.6	2.7		3.1
September	Max	13.9	14.8	14.1	14.7	13.1	14.4	14.6	14.0	14.7		14.4
	Min	3.6	4.7	4.5	4.4	3.8	5.9	6.1	4.5	4.3		4.8
October	Max	14.8	16.4	17.6	17.3	18.2	16.8	16.7	17.2	15.8		16.5
	Min	7.2	5.9	6.8	6.1	6.5	7.7	7.4	6.0	6.4		6.6
November	Max	18.2	16.8	18.5	19.6	19.1	18.8	19.8	17.9	20.9		18.2
	Min	7.8	6.8	9.6	8.0	7.9	8.5	8.9	8.3	9.8		8.1
December	Max	19.2	20.9	21.3	19.7	21.0	20.8	23.2	18.8	20.7		20.1
	Min	11.1	11.5	11.7	10.5	9.7	10.6	12.2	12.0	10.4		10.5
Year mean	Max		16.2	17.3	16.8	17.4	17.7	17.1	16.9	17.7		16.4
	Min		6.4	7.5	6.9	6.9	7.5	7.4	7.6	7.5		7.6

